

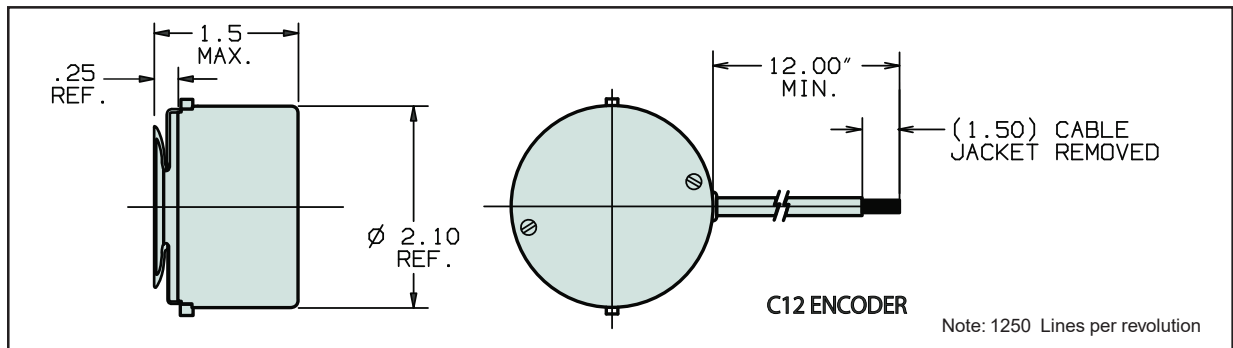
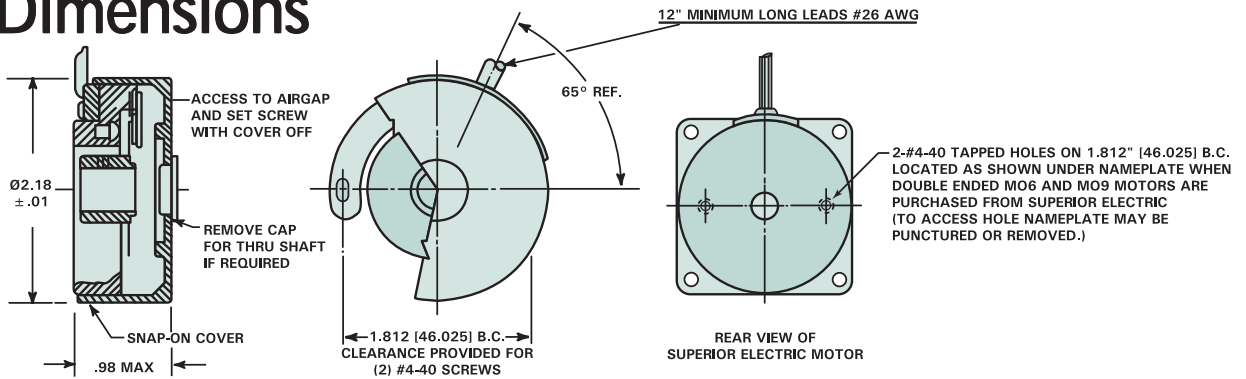
Incremental Rotary Optical Kit Encoders

200, 400, 500 lines per revolution

1250 lines per revolution

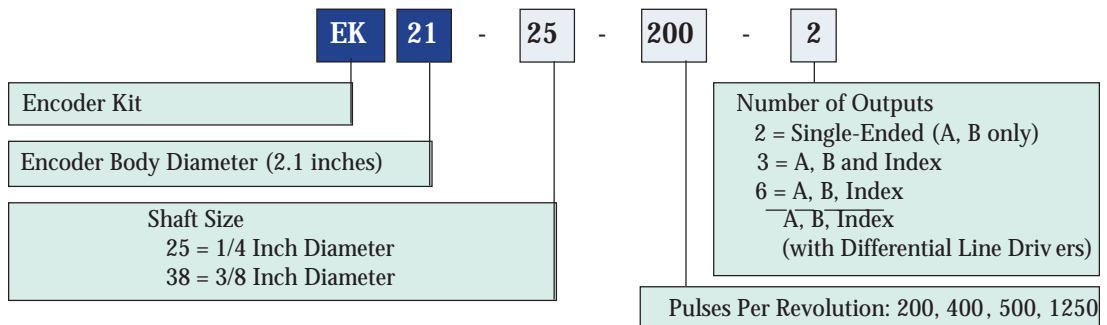


Dimensions



ORDERING INFORMATION

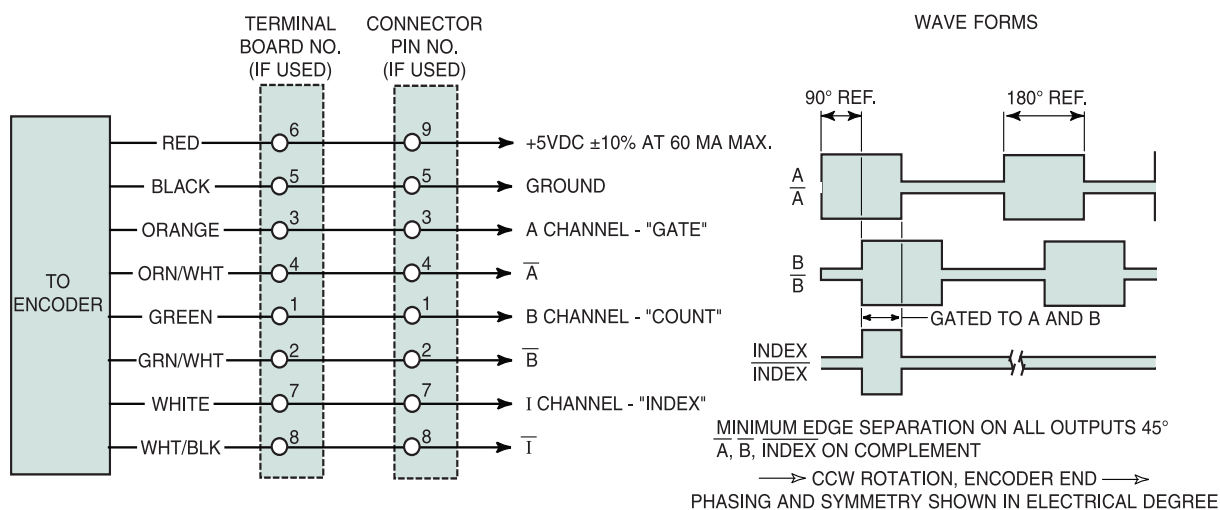
The following diagram explains the Encoder Kit number system:



SLO-SYN® DC STEP MOTORS

ENCODERS

Specifications	200, 400, 500 Lines per rev	1250 Lines per rev
Mechanical Specifications		
Weight	2.1 ounces	6 ounces
Moment of Inertia	2.6×10^{-4} oz-in-sec ² max.	5.0×10^{-4} oz-in-sec ²
Bearing Life		$L_{10} = 2$ billion revolutions
Acceleration	100,000 rad/sec ²	
Bore Size	0.250 in. or 0.375 in.	
Slew Speed	15,000 rpm max.	7,000 rpm max.
Strain Relief	withstands 10 lb. pull on cable or wire bundle	
Motor Interface		
Mounting Holes	2 x #4-40 at 180 on a 1.812 dia. bolt circle	
Perpendicularity (Shaft-to Mount)	0.005 in. TIR	
Shaft Endplay	-0.010 in.	-0.060 in.
Shaft Diameter required	0.2495 / 0.2500 in. 0.3745 / 0.3750 in.	
Minimum useable shaft length	0.56 in.	Min. required 0.70 in.
Electrical Specifications		
Code	Incremental	
Cycles per Revolution	200, 400, 500, as specified	1250
Supply Voltage	5 VDC	
Output Format	dual channel quadrature, 45 min. edge separation	
Output Format Options	index and complementary outputs	
Output Type, Less Complements	square wave TTL compatible short-circuited protected capable of sinking 10mA	
Output Type, With Complements	differential line drivers (26LS31) capable of sinking 20mA	
Frequency Response	100 kHz	
Frequency Modulation	-0.5% max. @ 50 kHz	1% max.
Frequency Accuracy	3.0 arc min. max. (zero runout)	
Environmental Specifications		
Operation Temperature	-10 C to +80 C (less complements) -10 C to +100 C (with complements)	0 C to + 85 C
Storage Temperature	-20 C to +100 C (less complements) -40 C to +100 C (with complements)	-30 C to +110 C
Enclosure	Unsealed housing, (must be protected from harsh environments)	



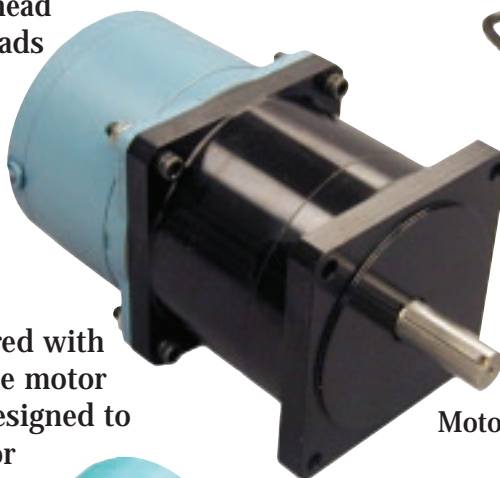
ENCODER CONNECTION DIAGRAM AND OUTPUT WAVEFORM

SLO-SYN® Gearheads

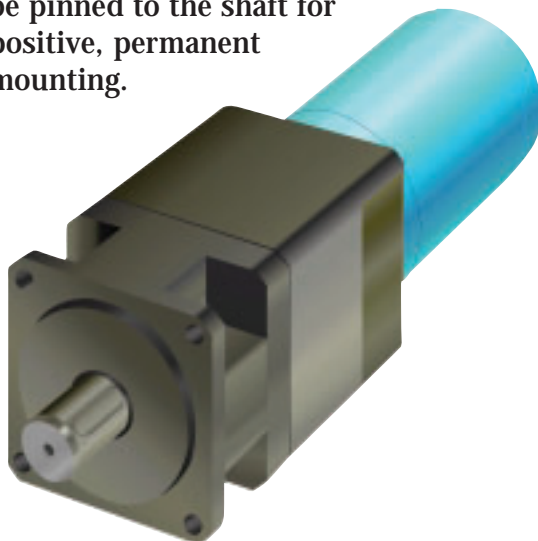
Many applications need a higher torque or a smaller step angle than is possible by directly driving the load from the motor shaft. An ideal way to satisfy these requirements is by using a motor that has an integrally mounted gearhead. SLO-SYN DCGearheads are available in precision NEMA and Planetary models to meet the need for speed reduction without the problems associated with belts or pulleys. The wide range of available ratios assures a design solution for virtually any Motor with NEMA Gearhead application. The Gearheads can be supplied as a complete assembly with the Gearhead already mounted to a SLO-SYN motor, or as a kit for mounting to an existing motor. Both NEMA and Planetary types are offered with a clamp-on pinion for the motor shaft or with a pinion designed to be pinned to the shaft for positive, permanent mounting.



NEMA Gearhead Kit



Motor with NEMA Gearhead



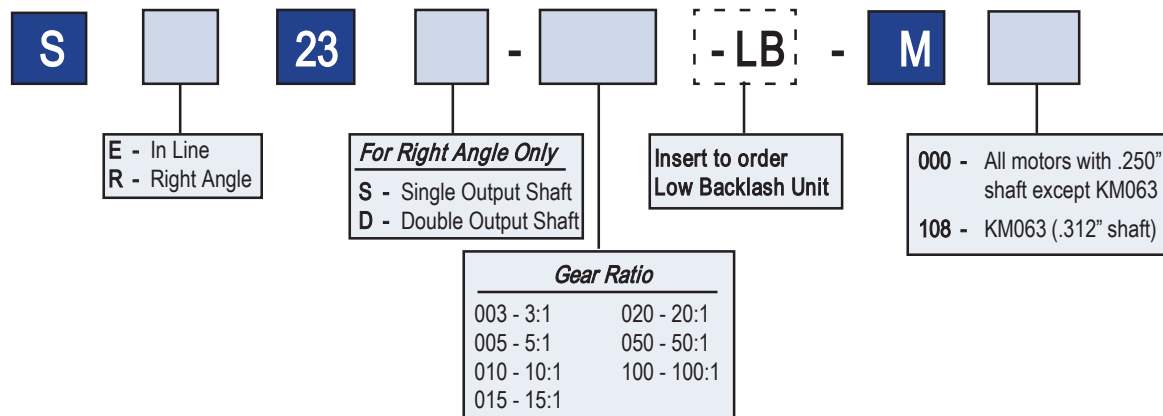
Planetary Gearhead on DC Stepper Motor



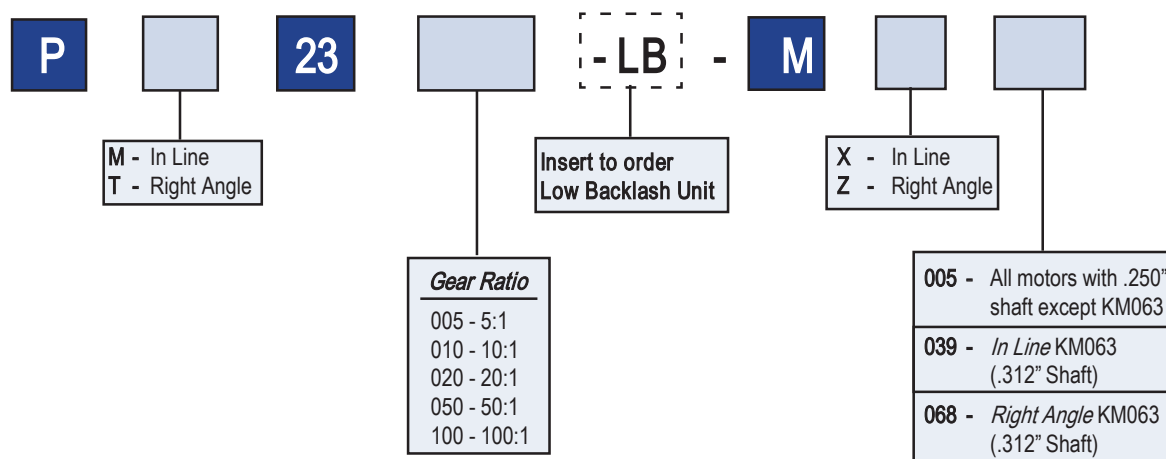
Planetary Gearhead Kit

Gearhead Options and Ordering Information

60mm NEMA 23 Spur Gearheads

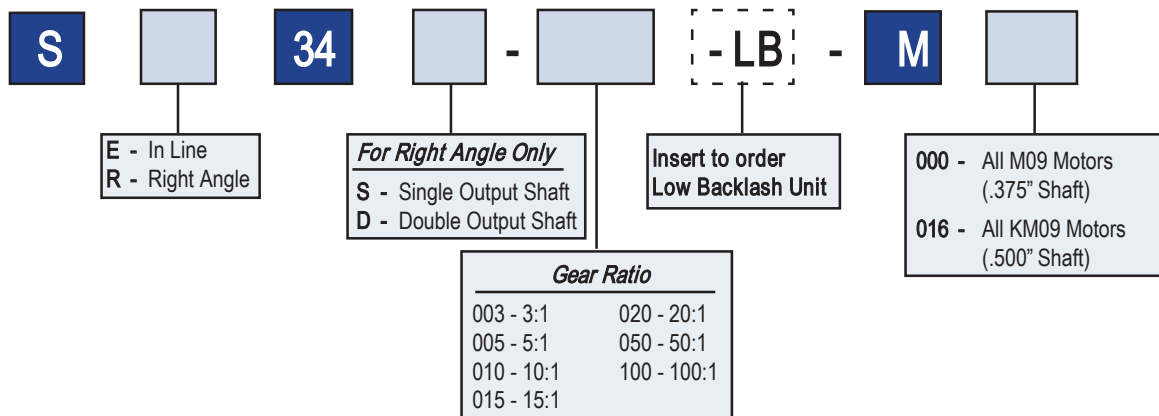


60mm NEMA 23 Planetary Gearheads

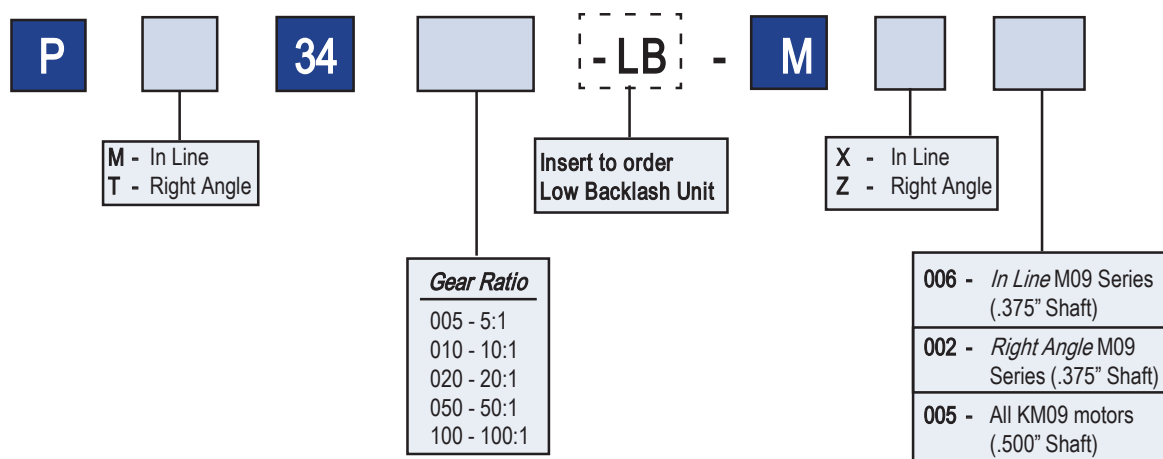


Gearhead Options and Ordering Information

90mm NEMA 34 Spur Gearheads

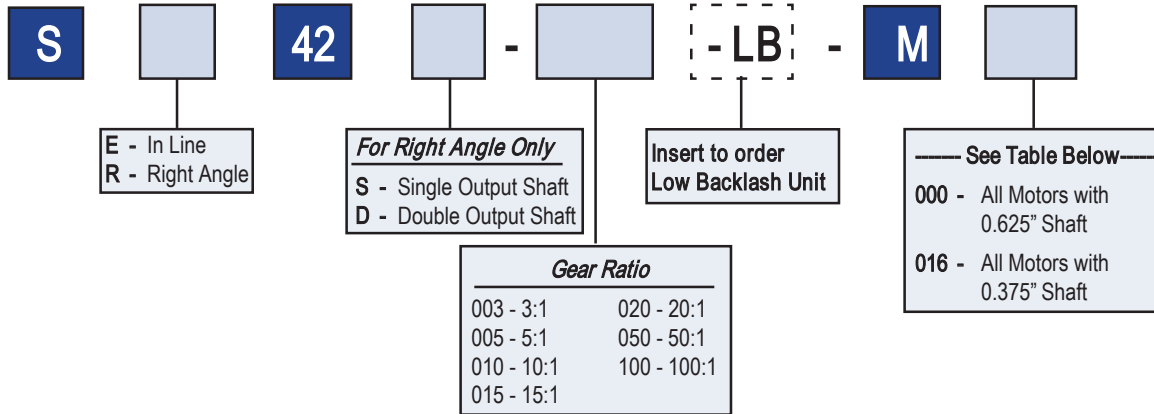


90mm NEMA 34 Planetary Gearheads

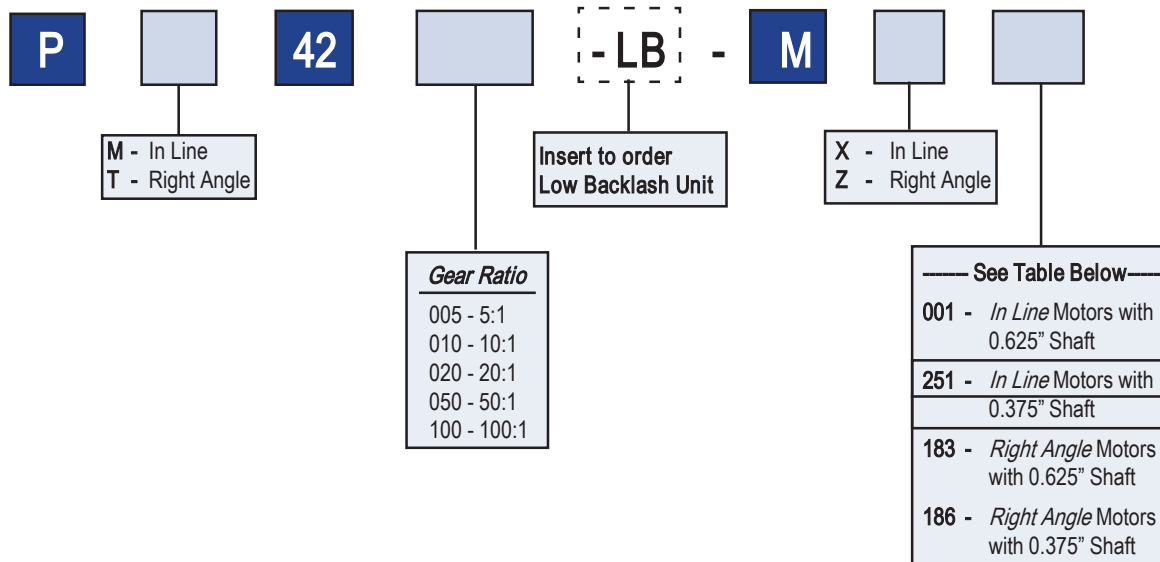


Gearhead Options and Ordering Information

110mm NEMA 42 Spur Gearhead

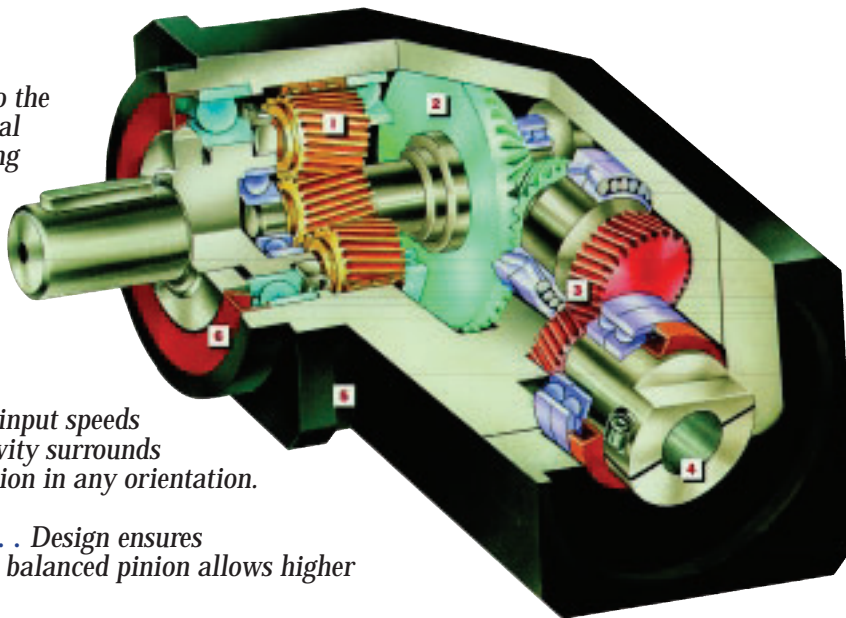


90mm NEMA 42 Planetary Gearheads



Type Number	Shaft Diameter
M111-FF-206	0.375
M111-FF-401	0.375
M111-FD12	0.375
M111-FD8012	0.375
M112-FD12	No Gearbox Option
M112-FJ8012	0.625
M112-FF-206	0.625
M112-FF-401	0.625
M113-FF-401	0.625

New P Series Planetary Gearheads



1. Planetary Output . . .

Unique technology is built into the gearhead to deliver "The Helical Advantage" at the load-carrying output section.

2. Spiral Bevel Gears . . .

Deliver high efficiency and high torque in a compact, right angle package.

3. High Speed Input . . .

Helical gearing provides high input speeds with quiet operation. Input cavity surrounds the gears for constant lubrication in any orientation.

4. Patented Motor Mounting . . . Design ensures error-free installation and the balanced pinion allows higher input speeds.

5. Compact Design . . . 2 package lengths per frame size, 1 for ratios ≤ 10:1, 1 for > 10:1. Two lengths provides for a shorter packages for ratios ≤ 10:1.

6. IP65 Sealed Unit . . . Seals and O-Rings provide IP65 protection to prevent leaks and protect against harsh environments

New P Series Planetary Gearheads are available as In-Line (PM Series) and Right Angle (PT Series) Models. They provide 30% more torque than their predecessors while operating faster, quieter, and with more accuracy.

Specifications:

- Efficiency: PM Series = 90% • PT Series = 92%
- Noise: With 3000 RPM input speed, measured at 1 meter - 70dB
- Ratios: 5:1, 10:1, 20:1, 50:1, 100:1

Model No.	Output Torque				Rated Input Torque		Rated Input Speed	Moment of Inertia		Backlash
	Rated ⁽¹⁾		Peak ⁽¹⁾⁽²⁾		in-lb	(Nm)		oz-in-sec ²	(kg-m ²)	Standard/Low arcminutes
	in-lb	(Nm)	in-lb	(Nm)						

Stealth PM Performance Specifications

PM23	300	(34)	600	6(8)	Rated Output Torque + Applicable Ratio ⁽³⁾	5,000	1.5 X 10 ⁻³	(1.1 X 10 ⁻⁵)	15/10
PM34	800	(90)	1,600	(180)		4,000	3 X 10 ⁻³	(2 X 10 ⁻⁵)	15/10
PM42	1,600	(180)	3,200	(360)		4,000	7 X 10 ⁻³	(5 X 10 ⁻⁵)	15/10

Stealth PT Performance Specifications

PT23	35.8	(41)	716	(82)	25	(2.8)	4,000	1.7 x 10 ⁻³	(1.2 x 10 ⁻⁵)	10/6
PT34	916	(104)	1,832	(208)	75	(8.5)	4,000	3.3 x 10 ⁻³	(2.2 x 10 ⁻⁵)	8/4
PT42	1,792	(203)	3,584	(406)	150	(17.0)	4,000	7.7 x 10 ⁻³	(5.5 x 10 ⁻⁵)	8/4

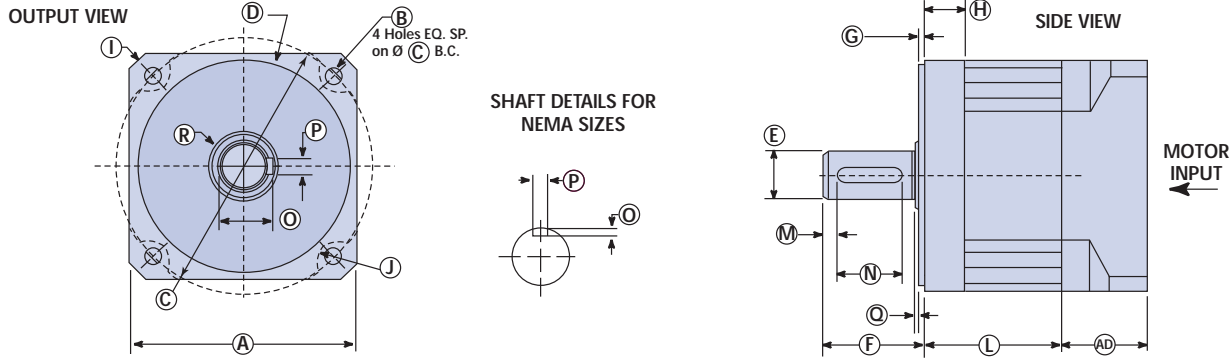
(1) Reduce ratings by 10% for 3:1, 10:1, 30:1, and 100:1 ratios
 (2) Peak torques not to exceed 5% of duty cycle.

(3) Ex: Rated Input Torque For a PM34 Gearhead with 5:1 Ratio = 90 Nm/5 = 18Nm (800 in-lb/5 = 160 in-lb.)

SLO-SYN® DC STEP MOTORS

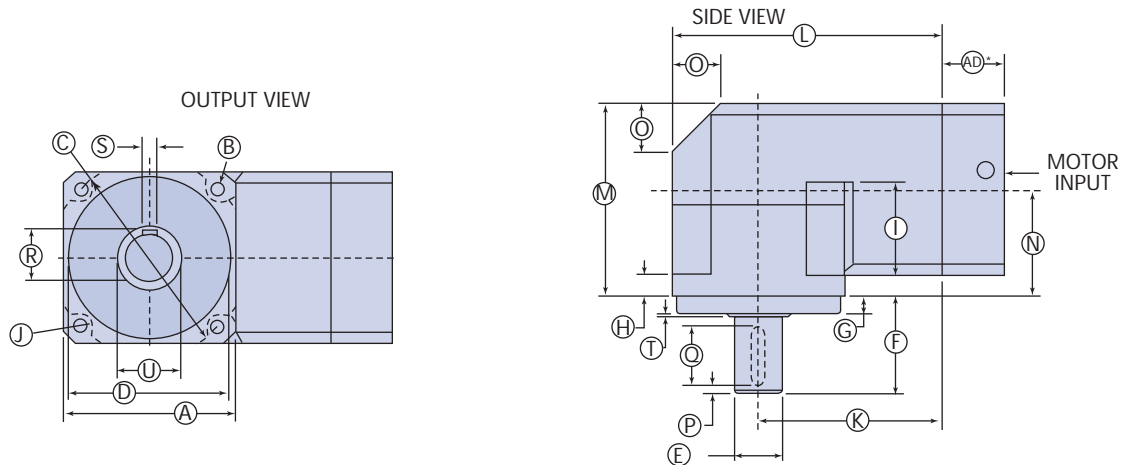
GEARHEADS

Dimensions



Model No.	A		B		C		D		E		F		G		H		I		J	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
PM23	2.36	(60)	.217	(5.5)	2.756	(70)	1.969	(50)	.630	(16)	0.98	(25)	.098	(2.5)	.51	(13)	3.15	(80)	.197	(5.0)
PM34	3.54	(90)	.256	(6.5)	3.937	(100)	3.150	(80)	.787	(20)	1.57	(40)	.118	(3.0)	.67	(17)	4.57	(116)	.256	(6.5)
PM42	4.53	(115)	.335	(8.5)	5.118	(130)	4.331	(110)	.945	(24)	1.97	(50)	.138	(3.5)	.79	(20)	5.98	(152)	.295	(7.5)

Model No.	AD		L1		L2		M		N		O		P		Q		R	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
PM 23	1.299	(33)	1.69	(43.0)	2.874	(73.0)	.118	(3)	0.630	(3)	0.709	(18.0)	.20	(5)	.04	(1.0)	0.87	(22)
PM 34	1.399	(36)	2.224	(56.5)	3.780	(96.0)	1.97	(5)	1.102	(5)	0.886	(22.5)	.24	(6)	.04	(1.0)	1.38	(35)
PM 42	1.693	(43)	2.670	(67.8)	4.551	(115.6)	.276	(7)	1.260	(7)	1.063	(27.0)	.32	(8)	.06	(1.5)	1.38	(35)



Model No.	A		B		C		D		E		F		G		H		I		J	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
PT23	2.36	(60)	.217	(5.5)	2.756	(70)	1.969	(50)	.630	(1.6)	1.460	(37)	.276	(7)	.310	(8)	1.417	(3.6)	.197	(5.0)
PT34	3.54	(90)	.256	(6.5)	3.937	(100)	3.150	(80)	.866	(2.2)	1.890	(48)	.394	(1.0)	.394	(1.0)	1.969	(5.0)	.256	(6.5)
PT42	4.53	(115)	.335	(8.5)	5.118	(130)	4.331	(110)	1.260	(3.2)	2.560	(65)	.472	(1.2)	.470	(1.2)	2.480	(6.3)	.295	(8.0)

Model No.	K		L		M		N		O		P		Q		R		S		T		U	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
PT23	2.598	(66.0)	3.78	(96)	2.87	(73)	1.693	(43.0)	.591	(1.5)	.079	(2)	.984	(25)	.709	(18.0)	.197	(5)	.059	(1.5)	.866	(22)
PT34	4.055	(103.0)	5.827	(148)	4.05	(103)	2.283	(58.0)	.984	(2.5)	.118	(3)	1.260	(32)	.965	(24.5)	.236	(6)	.059	(1.5)	1.350	(35)
PT42	4.820	(122.5)	7.090	(180)	5.08	(129)	2.810	(71.5)	1.260	(3.2)	.197	(5)	1.575	(40)	1.378	(35.0)	.390	(10)	.080	(2.0)	1.77	(45)

* AD = Adapter Length: PT23 - 25.4 (1.00); PT34 - 25.4 (1.00); PT42 - 38.1 (1.50)

S Series NEMA Spur Gearheads

1. Low Backlash . . .

20 arcminutes standard (SE models)

30 arcminutes standard (SR models)

2. Quick, Easy Mounting . . .

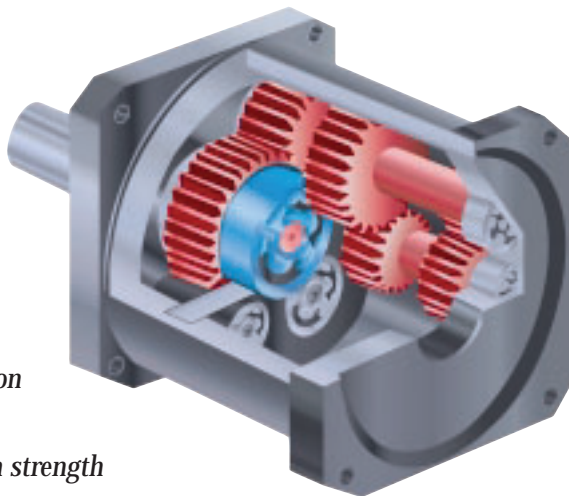
Special Clamp-On Pinion for easy motor mounting

3. High Efficiency . . .

Precision spur gears raise efficiency above 92%

4. Mounts in any Orientation . . . Because they are grease-filled, the gearhead can be used in any orientation without messy oil leaks.

5. Long Life . . . Single piece construction gears and high strength aluminum alloy housing ensure long, reliable life.



S Series NEMA spur gearheads are available as In-Line (SE series) and Right Angle (SR Series) models. They are designed to mount directly to the face of the motor. NEMA Gearheads are ideal for applications requiring smooth operation and low starting torque.

Specifications:

Efficiency: SE and SR Series = 92%

Ratios: 3:1, 5:1, 10:1, 15:1, 20:1, 50:1, 100:1

Model No.	Output Torque				Rated Input Torque		Rated Input Speed	Moment of Inertia		Backlash Standard/Low arcminutes
	Rated		Peak ⁽¹⁾		in-lb	(Nm)		oz-in-sec ²	(kg-m ²)	
	in-lb	(Nm)	in-lb	(Nm)						

NEMA SE Performance Specifications

SE23	50	(6)	100	(11)	Rated Output Torque + Applicable Ratio ⁽²⁾	4,000	7 X 10 ⁻⁵	(5 X 10 ⁻⁷)	20/10
SE34	250	(28)	500	(56)		4,000	5 X 10 ⁻⁴	(4 X 10 ⁻⁶)	20/10
SE42	500	(56)	1,000	(112)		4,000	4 X 10 ⁻³	(3 X 10 ⁻⁵)	20/10

NEMA SR Performance Specifications

SR23	50	(6)	100	(11)	Rated Output Torque + Applicable Ratio ⁽²⁾	4,000	8 x 10 ⁻⁵	(6 x 10 ⁻⁷)	30/15
SR34	250	(28)	500	(56)		4,000	6 x 10 ⁻⁴	(4 x 10 ⁻⁶)	30/15
SR42	500	(56)	1,000	(112)		4,000	5 x 10 ⁻³	(3 x 10 ⁻⁵)	30/15

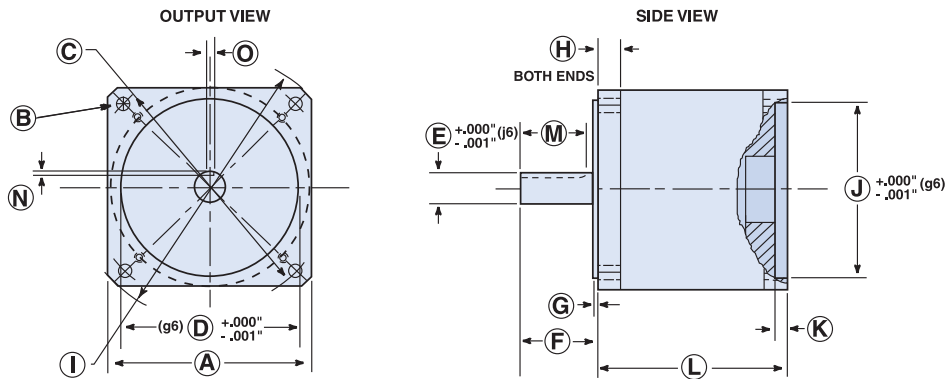
(1) Peak torques not to exceed 5% of duty cycle.

(2) Ex: Rated Input Torque for an SE34 Gearhead with 5:1 Ratio = 28 Nm/5 = 5.6 Nm

SLO-SYN® DC STEP MOTORS

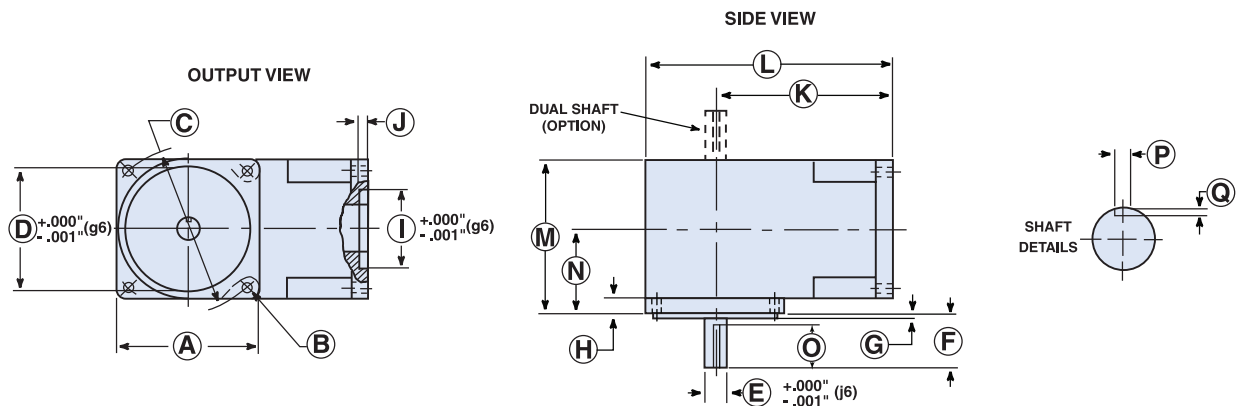
GEARHEADS

Dimensions



Model No.	A Square Flange		B Bolt Hole		C Bolt Circle		D Pilot Diameter		E Output Shaft Diameter		F Output Shaft Length		G Pilot Thickness		H Flange Thickness		I Housing Diameter	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
SE23	2.77	(58)	.195	(5.0)	2.625	(66.7)	1.500	(38.1)	.375	(9.5)	1.00	(25.4)	.062	(1.6)	.19	(5)	3.00	(76)
SE34	3.25	(83)	.218	(5.5)	3.875	(98.4)	2.875	(73.0)	.500	(12.7)	1.25	(31.8)	.065	(1.7)	.38	(10)	4.38	(111)
SE42	4.20	(107)	.281	(7.1)	4.950	(125.7)	2.187	(55.5)	.625	(15.9)	1.50	(38.1)	.093	(2.4)	.50	(13)	5.63	(143)

Model No.	J Input Pilot Diameter		K Input Pilot Depth		L Housing Length		M Keyway Length		N Keyway Depth		O Keyway Width	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
SE23	1.501	(38.1)	.125	(3.2)	2.30	(56)	0.75 flat	(19)	.015 flat	(0.4)	-	-
SE34	2.876	(73.1)	.200	(5.1)	2.99	(76)	1.06	(27)	.072	(1.8)	.125	(3.2)
SE42	2.188	(55.6)	.187	(4.7)	3.73	(95)	1.13	(29)	.108	(2.7)	.188	(4.8)



Model No.	A Square Flange		B Bolt Hole		C Bolt Circle		D Output Pilot Diameter		E Output Shaft Diameter		F Output Shaft Length		G Output Pilot Thickness		H Flange Thickness		I Input Pilot Diameter	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
SR23	2.27	(58)	.195	(5.0)	2.625	(66.7)	1.500	(38.1)	.375	(9.5)	1.00	(25.4)	.062	(1.6)	.22	(6)	1.501	(38.1)
SR34	3.25	(83)	.218	(5.5)	3.875	(98.4)	2.875	(73.0)	.500	(12.7)	1.25	(31.8)	.065	(1.7)	.38	(10)	2.875	(73.1)
SR42	4.25	(108)	.281	(7.1)	4.950	(125.7)	2.187	(55.5)	.625	(15.9)	1.50	(38.1)	.093	(2.4)	.50	(13)	2.188	(55.6)

Model No.	J Input Pilot Depth		K Dist. to Output Centerline		L Housing Length		M Housing Width		N Dist. to Input Centerline		O Keyway Length		P Keyway Wdth		Q Keyway Depth	
	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)	in	(mm)
SR23	.080	(2.0)	3.09	(78)	4.22	(107)	2.49	(63)	1.36	(35)	0.75 flat	(19)	--	--	.015 flat	(0.4)
SR34	.200	(5.1)	4.33	(110)	5.96	(151)	3.63	(92)	2.00	(51)	1.13	(29)	.125	(3.2)	.072	(1.8)
SR42	.187	(4.7)	5.38	(137)	7.50	(191)	4.75	(121)	2.63	(67)	1.13	(29)	.188	(4.8)	.108	(2.7)